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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
TUROCY, DAVID P	
ART UNIT	PAPER NUMBER
1792	
MAIL DATE	DELIVERY MODE
03/04/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/679,764	Applicant(s) JANGJIAN ET AL.	
	Examiner DAVID TUROCY	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 03 December 2007.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-12,14 and 15 is/are pending in the application.
4a) Of the above claim(s) 5 and 6 is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) 1-12,14 and 15 is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 1/30/06.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Species A in the reply filed on 12/3/2007 is acknowledged.

Specification

2. The disclosure is objected to because of the following informalities:

3. The use of the trademark BLACK DIAMOND has been noted in this application. It should be capitalized wherever it appears and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 9 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claims 9 and 14 include recitation of a trademark and since such use in the claim is a limitation to identify or describe a particular material or product, the claims do not comply with 35 USC 112 2nd paragraph. *Ex Parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). See MPEP section 2173.05(u).

Double Patenting

6. Applicant is advised that should claim 2 be found allowable, claim 11 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 1, 2, 7-10, 11, 14, and 15 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for supplying NF_3 gas (or the non-elected C_xF_x gas) as the reactant gas, does not reasonably provide enablement for any number of infinite number of reactant gases in situ. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims.

9. The nature of the invention involves application of a low-k dielectric layer and then in situ introducing a reactant gas, selected from an infinite number of possible layers, to etch back and deposit another dielectric layer containing an extra element provided by the reactant gas. The state of the prior art is silent to various reactant gases that are capable of etching back and depositing a layer of dielectric with an extra element in such a manner and while the skill of one ordinary in the art is relatively high, the claims required a chemical reactions and deposition of coatings which is a highly exact science. Additionally, while the specification clearly describes with sufficient specificity the use of NF_3 results in etching back a low-k film and additionally deposits a dielectric layer with a nitrogen compound, the specification fails to include any working examples or direction as to a representative number of species of the infinite number of possible reactant gases, which would result the etch back and deposition as required by the claim. This undue experimentation would encompass determining which reactant gases, selected from a seemingly infinite number of possibilities etch back the deposited low-k layer and also deposits another dielectric layer with additional element as required by the present claims. See *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

> invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 1, 2, 3, 7, 8, 9, 11, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacNeil et al. (US Patent Publication 2001/0030369 A1) in view of Zhang et al. (US Patent 6468927 B1).

MacNeil discloses a method for forming a inter-metal dielectric layer over a substrate, including introducing a process gas to form a low-k dielectric layer over a substrate and in situ introducing a reactant gas to react with the process gas to form a dielectric layer to form a dielectric layer containing the extra element on the dielectric layer, wherein the extra element is provided by the reactant gas (0004-0018, 0026-0031). The examiner notes MacNeil discloses adjusting the process gases to deposit various layers on the surface of a substrate, in any order, to form the desired stack structure and doing so in a single chamber (0026). Therefore, MacNeil discloses adjusting the layers deposited is known to lead to predictable results and therefore the selection of the order of layers on the substrate would have been obvious to one of ordinary skill in the art to reap the benefits of the desired stack orientation.

MacNeil discloses supplying N_2 to the process to provide nitrogen incorporation; however, the reference fails to discloses NF_3. However, Zhang discloses providing a process gas to provide nitrogen into a dielectric layer, discloses N_2 and NF_3 are known equivalents for providing nitrogen into the layer and such a substitution would have predictably yielded nitrogen into the layer (Column 2, lines 55-60) and therefore the claim would have been obvious because the substitution of one known element for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

As for the requirement that the reactant gas etches back the low-k layer, the examiner notes the process of MacNeil in view of Zhang discloses supplying NF_3 into the process chamber in situ and therefore the prior art discloses all the process steps as claimed by the applicant, see claim 1, and therefore the process of MacNeil in view of Zhang must necessarily result in etching back the low-k dielectric layer.

Claims 2 and 11: MacNeil discloses supplying a nitrogen gas to form a methyl doped Silicon nitride in the ratio as claimed (0028). Additionally, MacNiel discloses supplying the gases in various flow rate ratios result in the deposited layer and the properties associated therein (0026) and therefore, MacNeil clearly discloses adjusting the gas flow, including ratio, is a known result effective variable. It would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the gas supply ratio used in the process of MacNeil in view of Zhang, through routine experimentation, to impart the deposited layer with the desired properties.

Claim 3: These limitations are discussed above.

Claims 7-9, and 14: MacNeil discloses depositing a layer of methyl doped silicon dioxide, using a alkyl silane and plasma and such can reasonably be interpreted to be black diamond or OSG as required by the claims.

12. Claims 4 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacNeil et al. (US Patent Publication 2001/0030369 A1) in view of Zhang et al. (US Patent 6468927 B1) and further in view of the ASA (The admitted state of the art as disclosed by the applicant)

MacNeil in view of Zhang is applied here for the reasons as applied in paragraph 11 above, however, the references fail to disclose providing nitride layers. However, ASA discloses depositing silicon nitride layers below the low-k dielectric and above the second dielectric is a known dual damascene stack and therefore, taking the references collectively, it would have been obvious to one of ordinary skill in the art to have provided a dual damascene stack, with multiple SiN layers as suggested by ASA with a reasonable expectation of predictable results because MacNeil discloses OSG and SiN layers are sequentially deposited in a single chamber to form the desired dielectric stack.

13. Claims 9, 10, 14, and 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacNeil et al. (US Patent Publication 2001/0030369 A1) in view of Zhang et al. (US Patent 6468927 B1) and further in view of O'Neill et al. (US Patent 6716770 B2).

Claims 9 and 14: MacNeil in view of Zhang is applied here for the reasons as applied in paragraph 11 above, and the examiner maintains the position that the deposited layer can be reasonably interpreted to be deposited as black diamond. The examiner notes O'Neill discloses trimethylsilane and tetramethylsilane are known substitutes for the deposition of silicate films and the applicant discloses depositing black diamond using trimethylsilane and oxygen gas and therefore it would have been obvious to deposit the OSG layer using trimethylsilane with a reasonable expectation of predictable results because O'Neill discloses trimethylsilane and tetramethylsilane are known substitutes for depositing OSG films. Substitution of equivalents requires no express motivation. *In re Fount*, 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152, USPQ (CCPA 1967).

Claims 10 and 15: MacNeil in view of Zhang is applied here for the reasons as applied in paragraph 11 above, however, the references fail to disclose depositing a OFSG layer. However, O'Neill discloses OFSG has superior properties to OSG films (Column 5, liens 40-52). Therefore, taking the references collectively, it would have been obvious to one of ordinary skill in the art to have deposited a OFSG layer instead of the OSG layer, to reap the benefits of depositing a low-k film with superior properties.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID TUROCY whose telephone number is (571)272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David Turocy/
Examiner, Art Unit 1792

/Timothy H Meeks/
Supervisory Patent Examiner, Art Unit 1792